XVIII. *Notes on* Lycaena alcon *F., as reared in* 1918–1919.

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[Read November 5th, 1919.]

Plates XXIII–XXVIII.

My observations on the early stages of *Lycaena alcon* F., in 1917–1918, ending with the emergence of a ♂ imago on Aug. 2, 1918, are reported by Monsieur Oberthür, in the 16th volume of the "Études de Lépidoptèrologie Comparée," and referred to in the Proceedings of the Entomological Society of London, 1918, p. clv.

Monsieur Oberthür sent me larvae of *L. alcon* again in the autumn of 1918, and my observations on these are similar to those of the preceding year, but I have added an item or two. I have especially secured figures by Mr. E. C. Knight of the full-grown larva and pupa (Pl. XXIII). Mr. Knight's figures are remarkably good, though those of the larva do not suggest so strongly, as a close examination of the living larva does, that the fat-bodies are really the basis of the appearance of the larva and lead to the dorsal vessel appearing as a dark line down the back, a line in which really nothing is to be seen but the darkness due to its being overshadowed by the tissues beside it, making it an unoccupied chasm. It varies in width with the regular pulsations, and the figure shows a spot where it is rather wider as the pulsation passes along. I also succeeded in obtaining the larval skins cast on pupation, and one of these, obtained immediately it was cast, is not altogether a failure in mounting; the others were less successful. I was very glad to obtain these, as it enables me to show photographs proving that the head and prothoracic plate of the full-grown larva are identical with those of the small third instar larva that is carried into the ants' nests. However much any one may be willing to accept my word for this most remarkable circumstance in the life-history of a Lepidopteron, it is much more satisfactory to have actual demonstration submitted.

I had six nests of *Myrmica*, four of which were *M.*

scabrinodis and two *M. laevinodis*. Several of these were poor in quantity of brood and in other respects, but all accepted the larvae of *L. alcon* given them in September. On Sept. 13 they are noted as all grown and looking well.

On Oct. 13 No. 1 nest (*M. scabrinodis*) had practically no brood, but four *L. alcon* larvae. One of these was removed to nest 2, a newly taken nest of *M. scabrinodis*, with plenty of brood, this transferred larva soon disappeared, and the nest was used to supply No. 1 with ant brood, and in the result two *L. alcon* in No. 1 reached maturity.

No. 3 nest, *M. laevinodis*, had four *L. alcon*, one was given to nest 4 (also *M. laevinodis*), but disappeared. No. 4 nest was afterwards used to supply No. 3 with ant brood, and one *L. alcon* larva matured in No. 3.

Nos. 5 and 6 were small nests without much brood, each contained *L. alcon* larvae. So late as Dec. 16 No. 5 had one *L. alcon* and No. 6 had four. On Jan. 18, 1919, No. 6 had three *L. alcon* but hardly any brood, and No. 5 had by some oversight been allowed to get too dry and contained neither *L. alcon* nor ant brood, and the ants crowded round water as soon as supplied to them. It was a small nest, both as to the nest itself and the ants contained in it, and probably dried up too easily.

On Feb. 23 a larva in nest 6 was found dead, and later the others disappeared, probably from insufficiency of ant brood, though some was supplied from nest 2.

In the autumn the *L. alcon* larvae appear to suck the juices of the ant larvae, and the collapsed remains are found on the middens. The *L. alcon* increase in size and become several millimetres longer, but during the winter they dwindle again to nearly the size at which they entered the nest, and the larva in nest 3 that finally pupated, but not satisfactorily, was so small at the end of winter that I thought it could not come round.

In the spring the *L. alcon* eat the ant larvae, holding them between the head and the front of the forward abdominal segments, the necessary curvature being in the thoracic segments.

In the spring no collapsed ant larvae are found, nor did I find any frass containing ant remains, but my search was probably defective, as the middens (the glasses on which I gave them honey) were always very wet from deliquescence of honey, and full of remains of flies, earwigs

and other food provided, presenting a great difficulty to effective examination, that I failed adequately to face.

May 5.—There survive to-day three *L. alcon* larvae, two in nest 1 (*M. scabrinodis*) and one in nest 3 (*M. laevinodis*). Those in nest 1 are a larva (1) now about 7 mm. long and the other (2) still to all appearance of only wintering size. The one (3) in nest 3 looks rather starveling, but is always picked up and carried off by the ants when daylight is let into the nest.

May 19.—The *L. alcon* have grown. In nest 1 No. 1 is now fully 9 mm. long and stout in proportion, much paler in colour, light rose or flesh colour. No. 2 is only 5 mm., but looks stouter and paler and is to all appearance doing well. No. 3 (in nest 3) is about 6 mm. long and looks thriving, and contrasts with the starveling it was some two or three weeks ago. Since this month came in, it has been possible to get varied food for the ants, flies, small Tipulids, etc., but the increased activity of the ants, their larvae, and the whole nest, is probably seasonal rather than dietetic, though the latter is no doubt essential in view of the spring awakening. The ant larvae grow very markedly, and eggs are more or less plentiful in nests with queens.

May 25.—No. 1 is now very fat, all but 10 mm. long. No. 2 is growing well, about 6·5 mm. long. No. 3 has grown very well, nearly 7 mm. long. There are in nest 1 some worker ant pupae.

May 30.—No. 1 is 10 mm. long and about 2·5 thick. No. 2, 8 mm. and 2 mm. thick. No. 1 is very pale, not whitish, but very whitey pink. No. 2 is darker, about a flesh-colour. No. 1 is therefore about twice the bulk of No. 2. An ant is about 4 mm. long and averages perhaps 0·6 mm. thick. The respective bulks would be: No. 1, 62 c.mm.; No. 2, 32 c.mm.; an ant 1·5 c.mm. Yet the ants manage to move the larvae about. No. 3 is 9 mm. long by about 2·3 across, not of quite so pale a tone as No. 1.

The ant larvae in nest 3 have been dwindling in numbers of late, and yesterday I gave them more from another nest; there can be little doubt that the *L. alcon* larva must actually eat them.

June 9.—No. 1 *L. alcon* very pale, 11 mm. long. No. 2 seen on examining nest to have half a larva (or rather less) held between its head and forward abdominal segments,

the head being depressed by bending of thorax. In a few minutes, no doubt owing to disturbance, the larva straightened itself and the small size of the remains of ant larva was evident; the nest contained only full-grown larvae and pupae.

June 12.—No. 3 *L. alcon*, figured × 4 by Mr. Knight (Pl. XXIII). It looked 11 or 12 mm. in nest, but is 14 mm. when out of nest and measure can be put against it. It has a black patch beneath mesothorax, so it is supposed all is not well with it. The nest is now a rather dirty one. Whilst having his portrait taken the larva showed an activity much beyond what one expected from its quiet sedentary attitude in the nest, and whilst out of the nest, must have walked a good many feet.

June 12.—Looking into nest 1 at 6 p.m. (G.M.T.) this evening, larva No. 2 was seen resting on the floor of the nest, with his head and two first segments raised and his head advanced forwards (sphinx attitude), and an ant, also with her front raised, had her mouth and that of the *L. alcon* in contact. Luckily I had a lens in hand and was able to scrutinise them for ten or twelve seconds, when the process ended, the ant going off and the larva dropping his front segments to the floor of the nest. I directed attention specially to the adjacent mouths, and so failed to note precisely the altitude by which the head of the ant was raised. I was looking down on the tops of both the heads, and the movements of the mouth parts touching each other were unquestionably those of food being passed from the ant to the larva, viz. slight to and fro movements from one to the other, with adjuvant movements, or aspects of the same movement, of the maxillae, etc. It is difficult to describe this simply or at all, considering how short a time for observation was allowed, but the heads being in a plane on which one looked down at right angles, and the two heads being just far enough apart to show the mouth parts of both projected between them, their movements as observed could clearly only be those of food passing from one to the other. I feel, however, that the more I try to elaborate the account of what I saw, the less I shall probably convey to any one else the certainty that I immediately felt that the ant was feeding the *L. alcon* larva.

June 15.—*L. alcon* No. 3 shows a slight enlargement of prothorax, whether as first preparation for pupation or

in connection with black patch uncertain. *L. alcon* No. 1 shows very markedly about and below spiracular region the "fat-bodies" with their rounded convolutions and sulci between, filled with clear fluid, not at all unlike cerebral convolutions.

June 16.—No. 2 can hardly be called smaller than No. 1. Yet in colour No. 1 is almost yellow, a pale sandy colour, whilst No. 2 is still pink, a warm flesh colour.

Shortly after last entry, on looking into the nests, No. 2 was seen to have the remains of an ant larva in the usual position, the front segments curled ventrally so as to bring them round the small remains of the ant larva, held by this curvature and between the prothorax (and head) and the 3rd and 4th abdominal segments. In no case has the larva gone on eating when exposed to the light.

No. 3 seems to have mesothorax rather swollen.

June 16.—Third note, later, 4.30 p.m. (G.M.T.). No. 3 *L. alcon* is found to be lethargic and motionless, the thoracic segments are enlarged, more in length than thickness, there is a slight waist at 1st abl. The abdominal segments are still thicker than the thoracic. The black marks remain as noted, *i. e.* not extending in any way. The larva is obviously near pupation, so is placed alone in a separate vessel to try to secure cast skin. Whether the black marks will prevent due pupation remains to be seen.

June 18.—No. 3 found this morning to have pupated, the skin is cast, but the black mark seems to have been removed only by some tearing (of 1st leg probably), and some bleeding had occurred, and the pupa looks shrunk, so will probably not mature.

No. 1 was last night away from brood, with a few ants in attendance, and prothorax looked swollen. This morning, lengthening of thorax and appearance of waist shows preparation of pupal moult.

June 19.—No. 1 is laid up for pupation, quite lethargic.

No. 2 is measured to-day, over 14 mm., not quite 15; moving too much to be quite precise; is still pink, though pale, not yellowish like Nos. 1 and 3 when full grown.

June 20.—7 a.m. No. 1 has just pupated. No. 3 pupa apparently alive, but discoloured in places.

No. 2 seems larger and fatter and rather paler; is a little away from brood.

June 22.—No. 2 lies away from brood, lethargic, meso-thorax a little enlarged, 1st and 2nd abl. form a slight

waist, several ants keep running over it, pale, hardly to be called pink.

June 25.—12.1 p.m. (G.M.T.). No. 2 has just pupated.

July 4.—No. 2 pupa figured by Mr. Knight.

Mr. Powell tells me that he has succeeded in finding three larvae of *L. alcon* in nests of *Myrmica scabrinodis*, but not in the nests of other ants that he explored. One found on June 12 was about 7 mm. long. Two found on June 30 were 13 mm.

These larvae were clearly not so advanced as mine kept indoors, which are, however, three weeks in advance of the previous year—a difference to be attributed to the fact that the clerk of the weather sent us July and August instead of May and June. This, of course, affected the temperature of my room, though probably not that of the ants' nests in the wild, brood and larvae being carried by the ants to shallower or deeper apartments as might be necessary to secure a desired temperature.

July 19.—No. 1 *L. alcon* has quite matured in pupa, and seems to have been ready to emerge for the last two days, certain dark marks on the pupa that appeared shortly after change probably cause some adhesions preventing emergence.

No. 2 has black eyes and thickened wings, but as yet no coloration.

July 21.—9 a.m. (G.M.T.). No. 2, a ♀ *L. alcon* emerged.

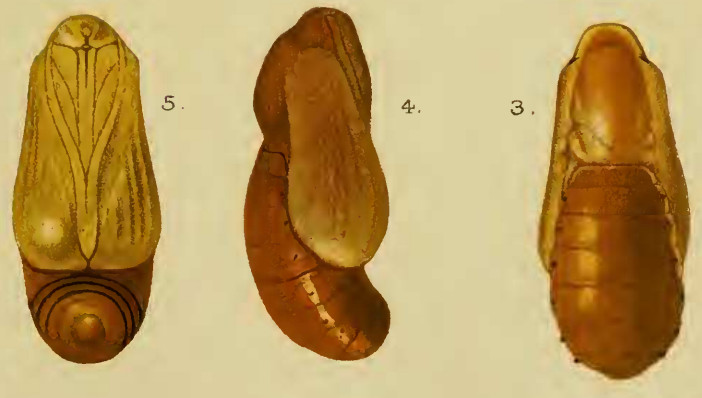
Explanation of Plates XXIII–XXVIII.

Lycaena alcon F.

Plate XXIII, fig. 1. Lateral view of full-grown larva × 4.

Fig. 2. Dorsal view of full-grown larva × 4.

If these are compared with the figures on Pl. DI of the 16th vol. of the "Études de Lépidoptèrologie Comparée," which show the larva at a much younger stage, practically that at which it leaves the gentian, the great difference in colour due to the extension of the skin, in or immediately beneath which the colour resides, is obvious. In the full-grown larva the skin is so stretched and the colour diluted by covering the larger area, that it retains only a faint pink tinge



E. C. Knight del. et chromo. Huth imp.

LARVA AND PUPA OF *LYCAENA ALCON* L.